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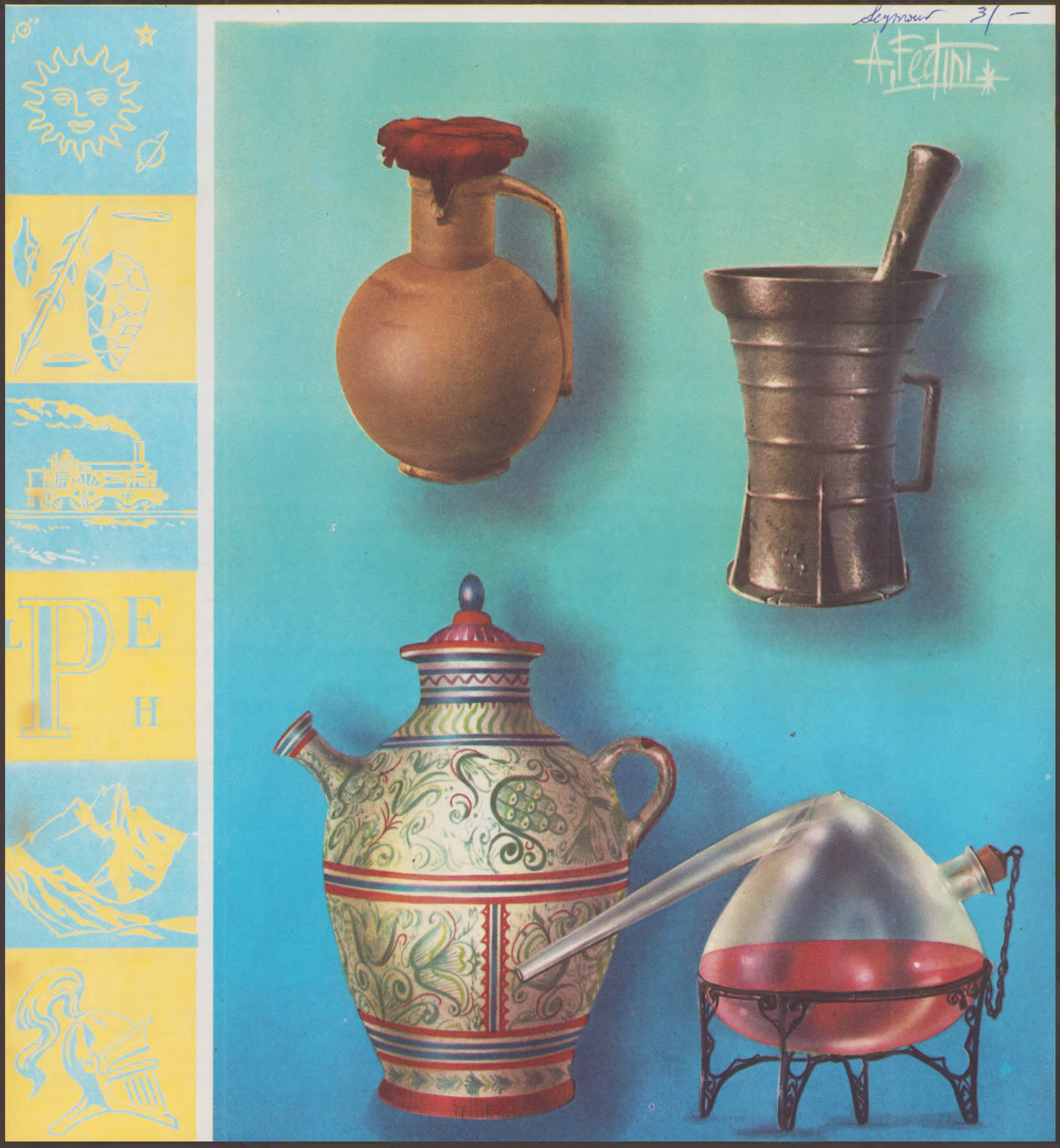

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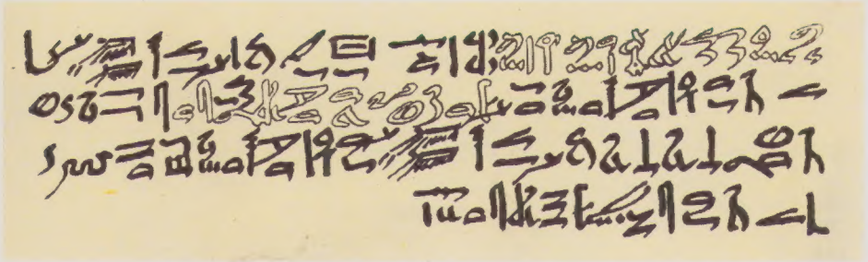
PHARMACY (part one)



Part of a recipe for driving away bewitchments, from the Ebers Papyrus. *It says: 'Take a large beetle, cut off its head and wings, heat and put in fat, and apply. If then you want to get rid of it, heat its head and wings, put in snake-fat, heat and make patient drink it.'*

PHARMACY is the art and science of preparing medicines, and it is undoubtedly one of the oldest of all human skills. It began when man, probably accidentally in many instances, discovered that by eating the leaves, flowers, seeds, or even the roots of certain plants, he could cause changes in the workings of his body. Perhaps he also observed how different kinds of herbage affected his flocks. After this, it was an obvious step to use these same plants deliberately in the treatment of illnesses.

In the earliest times there was no distinction between doctor and pharmacist. A single person determined the nature of an illness, collected the appropriate herbs, and finally dispensed the medicine. Very often this person was also a priest whose incantations, prayers, and charms were thought an additional aid to a speedy recovery. As the centuries passed, however, the vocations of pharmacist, doctor, and priest gradually became quite separate, until in Britain today none undertakes the duties of the others.

Pharmacy in Ancient Egypt

Our knowledge of the pharmacy of the Ancient Egyptians comes to us chiefly from a wonderful papyrus, the *Ebers Papyrus*, which is in the University Library at Leipzig. The date of this work is about 1500 B C, and it is clear that by that time the Egyptians were familiar with no less than 900 different medicines. Many of these medicines – aloes, opium, castor oil, and colchicum (from crocuses) – are still in use today, but others, like powdered emerald and lizard's blood, have long since been discarded.

Phoenician medicine flask

Greece, Rome, and Alexandria

A Roman memorial, showing a physician with his books and medicine chest

As in Egypt, so later in Greece medicine and pharmacy were practised together. Hippocrates, 'The Father of Medicine', was familiar with 400 herbal remedies; and Aristotle, a century later, was both physician and pharmacist. His devotion to pharmacy irritated his contemporaries, who called him 'a mere druggist', and thus secured for him the distinction of being the first pharmacist to be mentioned in history.

When Greece became less important, emigrants carried their knowledge of pharmacy to Alexandria and to Rome. Among them (though not strictly a Greek) was Claudius Galen, whose teachings were to influence pharmacy and medicine for a thousand years. Galen was a follower of Hippocrates. He treated his patients by diet, massage, exercise, and simple medicines made from herbs. Even to this day preparations of this kind are often spoken of as *galenicals*. Rather less simple was Galen's *mithridaticum* which was used as an antidote for the bites and stings of all venomous animals. It contained 73 ingredients.

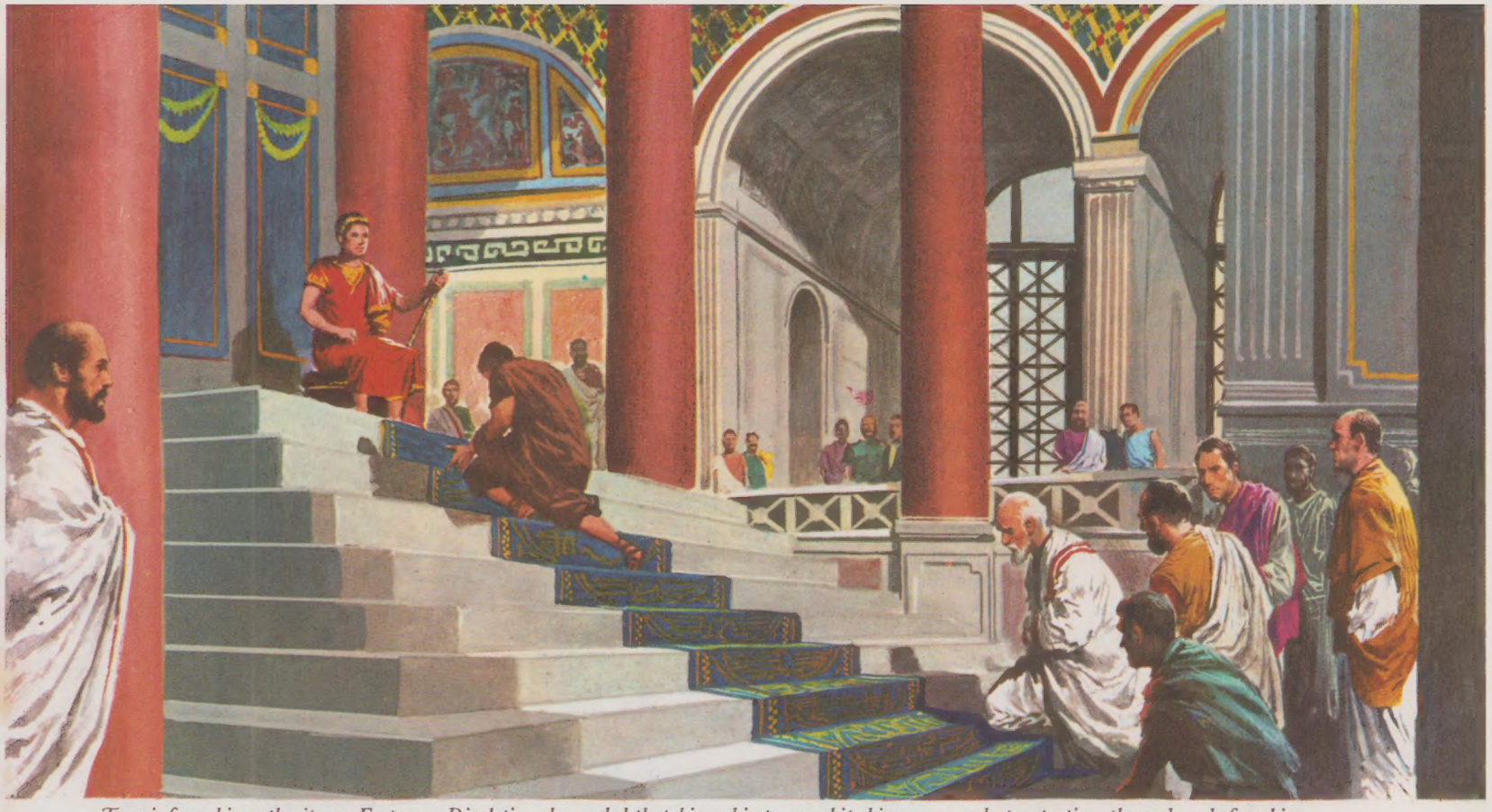
Arabian pharmacy

After the fall of the Roman Empire in the West in A D 476 Alexandria was the greatest centre of learning. In 642, however, this fine city was taken by Arab forces advancing from the East, and the skills of East and West were mingled.

Page from mediaeval herbal

The Arabs usually practised pharmacy and alchemy together. They made many useful discoveries, including distillation and crystallisation, and they introduced such valuable drugs as senna and camphor, for example, which are used to this day. The Arabs welcomed learned

Previous page: (top left) An ointment jar found in the tomb of the 17th-Dynasty Pharaoh Kha; (top right) an apothecary's bronze mortar (14th century); (bottom left) a 17th-century medicine jar; (bottom right) mediaeval glass retort with bung.



To reinforce his authority as Emperor, Diocletian demanded that his subjects worship him as a god, prostrating themselves before him

DIOCLETIAN

ON 17th September 284 the Emperor Numerian was found dead in his litter, near Nicomedia. For more than 50 years the Empire had been involved in exhausting and expensive wars against the Germanic tribes who were pushing down from the north (see page 2706). A strong and vigorous man was needed. Fortunately, the troops, who acclaimed as Emperor the commander of the imperial bodyguard, chose well. The new Emperor was Valerius Diocles, henceforth known by the more impressive name of Diocletian.

Diocletian was not of noble birth. His father was said to have been a mere clerk, and an ex-slave, but this did not really matter, for this was the age of soldier-emperors. Diocletian had to move at once to defend his title against a rival, Carinus, who held Italy. He marched west, and early in 285 defeated Carinus on the river Margus.

But although he was a competent general, Diocletian's greatest achievements were to be peaceful ones. He preferred planning and reconstruction to fighting. And such was his genius that his reforms changed the face of the Empire, and gave it new strength to resist the barbarian invaders.

The Empire was faced by a mass of problems. The most pressing was the ever-present threat from the barbarian tribes. But Diocletian had also to check the extreme power of the army, and ensure that the next emperor was appointed by himself, and not acclaimed by the troops in some distant province – as he himself had been. Thirdly, he had to reform the Empire's finances, which were in such a muddled state that many soldiers and civil servants were paid in rations (*annona*) rather than coinage. And – the most difficult task of all – he had somehow to restore the jaded spirit of the Empire and give people confidence. He had also to persuade people to get back to the land and work hard again, for the looting and burning of the invading tribes, the economic chaos, and the disorder of the last half century had caused many farmers to give up their work and drift into the big towns. And agriculture was essential to the prosperity of the Empire.

The division of the Empire

Early in his reign Diocletian decided that the difficulties of ruling the Empire were too much for one man. As his assistant he chose the soldier, Maximian. Diocletian, as the supreme ruler of the Empire, was *Augustus*; Maximian, as his second in command, bore the title, *Caesar*. Previous emperors had chosen a Caesar as assistant; but Diocletian went further, and soon raised Maximian to the rank of Augustus.

Bust of Diocletian – a harsh, thorough, and successful ruler

Coins with the heads of Diocletian (left) and Maximian, the two Augusti of the Empire

In theory the Empire was now ruled by two equal colleagues; but in practice Diocletian remained the master. To emphasise his seniority he took the name, Jovius, signifying that he was the representative on earth of the supreme god, Jupiter. Maximian was called Herculius after the hero and lesser god, Hercules.

However, even two emperors were not enough to rule such a vast empire, and in 293 Diocletian split the Empire into four parts (as shown in the map below), and founded the system known as *tetrarchy*. He himself, as Augustus of the east, took Galerius as his Caesar. Maximian, as Augustus of the west, took Constantius Chlorus, the father of the future Emperor, Constantine the Great, as his. To set the seal on the new arrangement, Galerius married Diocletian's daughter, Valeris, and Constantius married Maximian's daughter, Theodora.

This tetrarchy, or rule of four, had two great advantages. First, it meant that the Empire could be easily defended on all its frontiers. One of the four rulers could soon be on the scene if any danger arose. Moreover, it was now less likely that the army would acclaim some overpowerful general as Emperor. The four rulers would keep all the power for themselves, and the new system would solve the problem of the succession; for Diocletian clearly intended that the two Caesars should eventually take over the Empire when he and Maximian either retired or died.

Victorious campaigns

The new system worked well. Diocletian's authority was so great that his three colleagues, although they were ambitious and powerful men, remained completely loyal to him throughout his long reign. The four rulers were able to devote their energies towards crushing Rome's enemies, rather than fighting each other and wasting the resources of the Empire in perpetual civil wars, as their predecessors had done. In the west, Maximian campaigned successfully against the Alemanni, crushed a rebellion of discontented peasants known as the Bagaudae, and pacified Africa. His Caesar, Constantius, dealt decisively with a rebellious officer, Carausius, who had proclaimed himself Augustus in Britain. In 296 Constantius recovered Britain from the rebels, and the island entered on a new age of prosperity. Two years later Constantius gained a spectacular victory over the Alemanni in Gaul. Meanwhile in the east, Galerius, after an initial defeat, beat the Persian king Narses. And when the eastern frontier had been strengthened, the Empire appeared to be safer and stronger than at any time in the last 75 years.

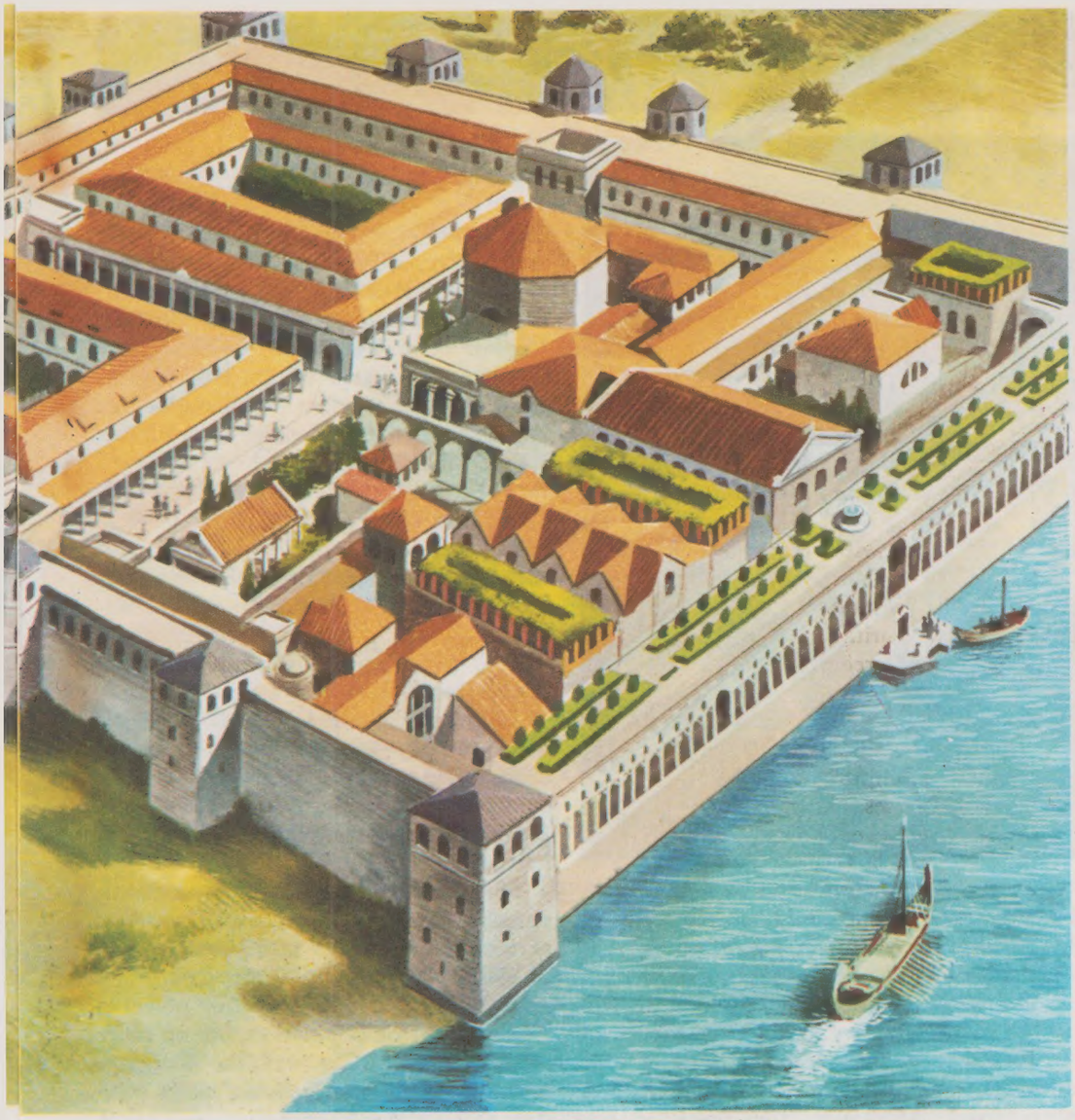
All this time Diocletian was at work, reorganising the workings of the Empire. He had a methodical – some would say fussy – mind. The effect of his reforms was to increase the majesty of the emperor, who became, with his luxurious court, like one of the absolute monarchs of the Hellenistic age (see page 2694); and to create a vast and complicated machinery for running the Empire. Diocletian reduced the larger provinces to a manageable size. Even Italy, for the first time, was divided up into provinces just like the rest of the Empire.

Reconstruction of the magnificent palace

In some of the old provinces the governor had been in command of the army. Diocletian changed this; from now on the provincial governor never had the command of an army, and so ceased to be a threat to the emperor's authority.

Not everyone liked these complicated reforms; one historian wrote that there was a great host of governors, officials, accountants, controllers, and deputies, who spread terror by confiscating goods and by forcing people to join the army. And the larger army and the hundreds of new administrative jobs were extremely expensive, and caused great hardship among the ordinary people. The harsh system of tying citizens down to their jobs probably began under Diocletian. Many, for instance, were forced, whether they liked it or not, to work on the land in one place for all their life.

The Roman Empire under Diocletian



at Salona (the modern Split) on the Dalmatian coast, where Diocletian spent his retirement

Financial reforms

Perhaps the most important of all were Diocletian's financial reforms; for without prosperity and efficiency within the Empire there could be no hope of resisting the attacks from outside. Not everything Diocletian did, however, was successful. He issued a new coinage, but still failed to stop the rising prices. His *Edictum de maximis pretiis* (edict concerning maximum prices) of 301, in which he fixed wages and the maximum prices at which goods might be sold throughout the Empire, also failed.

In the more important field of taxation Diocletian did achieve success. The old methods of assessing taxes were inefficient, and the Emperor had no way of knowing how much money he could raise from any one area. Diocletian simplified the system; taxes were now to be assessed on the basis of the *iugum* (an area of land) and the *caput* (an individual person). The Emperor could now easily work out how much tax he could raise from any city or province in the Empire; and thus he could make an annual 'budget', raising as much money in taxes as would be needed to pay the expenses of the next year. To make his system workable, Diocletian carried out a great census, calculating the population and the amount of land throughout the whole Empire, according to the *iugum* and *caput*.

Part of the ruins of Diocletian's palace at Salona

THE GREAT PERSECUTION

Towards the end of his long reign Diocletian altered his policy in a way which affected many thousands of people all over the Empire – the Christians. Diocletian and Galerius were performing a sacrifice, so the story goes, when something went wrong. The soothsayer explained that the sacrifice did not work because there were profane people present; and it was discovered that some Christians were there. Now the Christians refused to sacrifice to pagan gods, or to recognise the Emperor as divine. Diocletian, in anger, gave orders that all soldiers and civil servants must sacrifice; those who refused – the Christians – were dismissed from their jobs.

In 303 the persecution became worse; but probably this was the fault of the Christian-hater, Galerius, rather than of Diocletian. Christians were ordered to give up their copies of the Scriptures, and to cease meeting together for worship. Many were put to death for refusing.

DIOCLETIAN RETIRES

In 303 Diocletian visited Rome for the first time – for the emperors now used provincial cities like Nicomedia and Sirmium as their bases. Shortly after the visit Diocletian became seriously ill. On 1st May 305 he abdicated, and on the same day Maximian also resigned. The two Caesars, Galerius and Constantius, became Augusti, and two new Caesars were appointed.

No one knows why Diocletian retired. He was probably exhausted after his recent illness; and he must also have hoped that his new system would prevent a struggle for power. But the Empire was immediately torn by civil wars, from which Constantine emerged the victor. And Diocletian had to spend his declining years watching these disputes, which marked the failure of his schemes for the succession.

Diocletian died in 313. His reign had given the declining Empire a new lease of life.

ELECTING THE PRESIDENT

The noisy pageantry and excitement of the Democrats' National Convention

ON the first Tuesday after the first Monday in November, in every year that can be divided by four, the American people vote in a great 'triple-decker' election. This election is so all-embracing that numerous offices, from President down to sheriff, may change hands. It is so complex that special voting machines are used. It is the result of eight months of excitement, drama, pre-election elections, private bargaining, public speaking, pageantry, and exhibitionism, all recorded, and sometimes distorted, by the ever-watchful television, radio, and press.

Strictly speaking, it is not correct to talk of one election. What occurs are several separate elections: for the offices of President and Vice-President; for Congress – all the House of Representatives but only a third of the Senate; and for numerous state and local government offices – governors, attorney-generals, judges, and so on.

In Britain local government and general (Parliamentary) elections (see page 2134) are held at different times. The Prime Minister is chosen as a direct result of the Parliamentary elections. But in the United States the election of the President is quite separate from the Congressional elections. In fact, a President may find that the American people have elected him, but have given his party a minority in Congress. However, in Britain it would be virtually impossible for the Prime Minister to form a government controlling only a minority in Parliament. Another difference is that the British Prime Minister can, within limits, choose the time at which he will 'go to the country', while the American President is elected for a term of four years – and the date of the next election is fixed. Moreover, the times of the Congressional elections are fixed too. The House of Representatives is elected every two years, as is a third of the Senate. Each Senator remains in office for a period of six years.

These separate elections are in keeping with the American Constitution, with its determination to keep separate the organs of the Federal (central) government. So there must be separate elections for the *executive* (government headed by the President) and the *legislature* (Congress). Under the Constitution the separate states are given a considerable amount of self-government, and so they must have their separate elections too.

There are now two main political parties in the United States: the Republican ('G O P' or 'Grand Old Party') and the Democrats. Presidents Roosevelt, Truman, and Kennedy were Democrats; President Eisenhower was a Republican. The last member of another political party to be elected was a Whig, Millard Fillmore, in 1850. The first President, George Washington, who took office in 1789, was a Federalist.

Choosing the candidates

Each election year the Democrats and Republicans must choose their candidates for the Presidential election. The candidate must be a natural-born American citizen, aged 35 or over, and resident in the United States for at least 14 years. The party whose President is in power will probably (though not necessarily) choose the existing President as their candidate, unless he has already completed two terms in office, after which he cannot stand again.

The choice of the Presidential candidates is made at the *National Conventions* of the parties, which take place in July or August of election year. Each state sends a delegation whose voting power is based mainly on population, but on other factors as well. The way the delegates to the Convention are chosen varies from state to state. Sometimes they are chosen by the *State Conventions* of their party, sometimes by the registered members of their parties voting in what are known as *primary* elections, or sometimes by a combination of both these methods.

At these primary elections, some of the candidates for the delegations to the Convention indicate beside their names on the ballot papers which Presidential candidate they would like to see elected. This means that a vote for a certain potential delegate can also be interpreted as a vote for the Presidential candidate he supports. When the delegates are chosen by the State Conventions the party members can still make their views known as to which Presidential candidate they want. They vote in what are known as

Campaign buttons worn in support of Presidential candidates

Presidential Preference Primaries or *Presidential Advisory Primaries*. These primary elections are valuable indications of the relative popularity of the Presidential candidates and influence the way delegates vote at the Convention.

The National Conventions

Under the glare of spotlights and the inquisition of television cameras, accompanied by bands, parades, demonstrations, shouting, chanting, dancing, and singing, the National Conventions take place. Not only on the floor of the Convention (usually a sports arena), but in the hotel bedrooms, frantic bargainings and discussions go on. The managers and camp-followers of the rival candidates try to persuade the delegations to vote for them. Delegations frequently switch their votes – sometimes after much persuasion, sometimes on the floor of the Convention when they see how the voting is going. Sometimes a delegation 'consults' on the floor of the Convention; this is known as a *caucus*. During the ballots the roll of the states is called alphabetically, beginning with Alabama. Some states' delegates withhold their votes until they see how things are going; others will nominate their own leading politician ('favourite son'), but will probably switch to one of the main candidates when things begin to crystallise. In the Republican Convention the delegates vote separately. In the Democratic Convention some states vote as a block – that means, if a candidate has a majority in the state's delegation, he gets all its votes. The first candidate to get a clear majority wins, although several ballots are usually necessary. The same procedure is carried out for the selection of a Vice-Presidential candidate, but the Presidential candidate usually has the decisive say in whom the Convention will choose.

The election

After the two candidates have been chosen there is a comparative calm. The campaign begins in earnest in September. Today television has become all-important. It is said that Kennedy's superiority to Nixon as a television personality was what tipped the scales in their desperately close election contest. The old 'whistle-stop' train journeys are out of date – now candidates usually travel by plane.

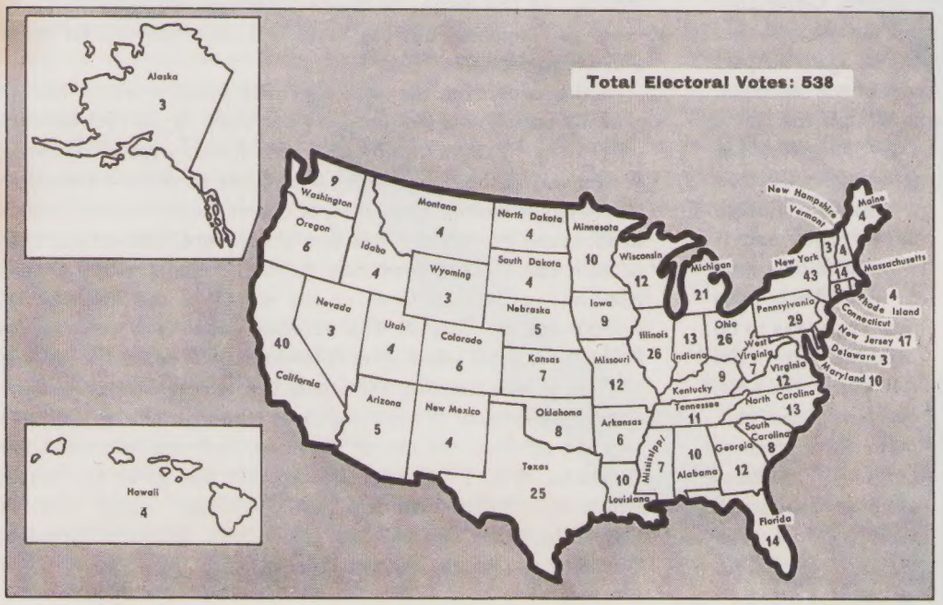
In November the election takes place. The qualifications for voters vary from state to state: literacy, length of residence, and payment of poll tax are some of the qualifications used. The voting age is 21 in all states except Georgia and Kentucky, where it is 18.

Voting is by secret ballot using either a paper ballot as in Britain, or the time-saving and increasingly popular voting machine. The latter is necessary because the election is not only for the office of President but for many other offices as well. This machine enables the votes to be cast by means of levers. The vote for the President and Vice-President cannot be split.

The actual result of the election is not dependent on a straight population vote, but on the vote of an electoral college, in which each state is allotted a certain number of votes dependent on population. The candidate who gets a majority in the state gets *all* that state's electoral college votes. If there is a dead heat (as happened in 1801 and 1825) the election is decided in the House of Representatives.

The results of the election are known around midnight on the day of polling. However, the votes are not formally counted until the first session of the new Congress in January. The Vice-President then proclaims the names of the new President and Vice-President, who take up office later that month.

Map of the United States showing the number of votes allotted to each state in the election of President. (The District of Columbia [not on map] has three votes)



Two supporters of Dwight Eisenhower, one of them holding a mask of their candidate for the Presidency

EUROPE AFTER THE FIRST WORLD WAR

WHEN, on the 11th hour of the 11th day of the 11th month of 1918, Germany surrendered, the leading statesmen of the time faced a colossal task. They had to construct a new Europe out of the ruins of the old. As a result of the First World War, Europe had the biggest shaking-up of its long history. Some of the mighty nations, which had dominated European history for centuries, collapsed. They were left empty shells of their former selves, while out of their territories were carved a host of new nations. Unfamiliar names like Czechoslovakia, Yugoslavia, Estonia, Latvia, and many others appeared on the map. The world was suddenly without Habsburgs, Romanovs, and Hohenzollerns, once the great ruling families of Europe. Perhaps even more important, America's intervention against Germany had been decisive. From now on she was to play a vitally important part in European politics, and this meant that, in one sense, the age of European history had finished and that of world history had begun.

THE TREATY OF VERSAILLES

The most important document of the peace was the **Treaty of Versailles** (28th June 1919). In order to understand some of its clauses, we must remember that public opinion was very hostile to Germany and her defeated allies. These countries were blamed for the war and were severely punished. In addition, the victorious statesmen, Lloyd George of Britain, Clemenceau of France, Wilson of the United States, and Orlando of Italy, believed in *nationalism* – the right of small nations and races to exist as independent states. It is, therefore, not surprising that out of the territories of the defeated powers – Germany, Austria-Hungary, Bulgaria, and Turkey – the Treaty of Versailles established many new nations. Some German colonies and Turkish provinces were not considered fit for complete independence, so they were placed under the mandate of one of the great powers. Thus Britain obtained mandates in Iraq and Palestine, and France a mandate in Syria. The mandatory powers were in charge of governing their territories, but they were responsible to the **League of Nations.** The foundation of the League was one of the most important decisions taken at Versailles. Though it had many defects, and was not joined immediately by America, Germany, or Russia, it was a great experiment in international co-operation and a direct forerunner of the United Nations.

NEW NAMES ON THE MAP

The first power to be weakened at Versailles was, of course, **Germany.** The French representative, Clemenceau, was insistent that Germany should be so weakened that she could 'never disturb the peace again'. Apart from crippling reparations (money exacted to pay the cost of war damage), her territory was drastically reduced. The German area west of the Rhine was de-militarised (that is, no German troops were allowed to enter it, and it was not to be armed or fortified); the Saar basin was to be occupied by the Allies; Eupen, Moresnet, and Malmédy were given to Belgium; **Alsace-Lorraine,** the traditional focus of enmity between France and Germany, was ceded to France. The cession of Alsace-Lorraine cost Germany 2 million subjects and three-quarters of her iron production.

These terms settled Germany's western frontier. In the north, northern Schleswig went to Denmark, but the eastern frontier proved far more difficult to adjust.

In the course of the war all three powers which had so greedily partitioned **Poland** between them in the 18th century – Germany (Prussia), Austria, and Russia – were defeated. Poland seized the opportunity once more to declare herself an independent nation. The Allies, of course, could do, and wished to do, nothing to prevent this. But where were Poland's frontiers to be? East Prussia projected far into Poland, while Danzig (Gdansk), a German town at the mouth of the Vistula, was surrounded by Poland. The solution found was to create a Polish 'corridor', which gave Poland a strip of territory running to Danzig, and allowing her access to the sea. Danzig was put under the control of the League of Nations. *East Prussia was thus cut off from the rest of Germany*, and this infuriated the Germans. West Prussia and Posen were also given to Poland, while, after fierce disputes, much of Upper Silesia went to Poland in 1921. Poland thus gained rich industrial areas of Germany and many German inhabitants.

Map showing the new nations which emerged after the Treaty of Versailles

Poland was not the only central European state to be created out of lands taken from the defeated powers. **Czechoslovakia,** composed of Czechs and Slovaks, was created out of those areas of Bohemia which touched Germany. Thus Germany's and Austria's only remaining point of contact was in Bavaria. The Treaty of Versailles forbade any future link between the two, except by consent of the League. This stipulation was, however, thrown overboard by Hitler in 1938 when he annexed Austria.

As finally constituted, Czechoslovakia had a population consisting of 6 million Czechs, 2 million Slovaks, 3½ million Germans, and about 1 million Magyars. In some ways she proved the most successful of the 'new' states. She contained many industrial regions, and plenty of raw materials, and was fortunate to have two extremely able Presidents, Masaryk and his successor, Benes, who between them guided Czechoslovakia to stability and prosperity.

THE BREAK-UP OF AUSTRIA-HUNGARY

In November 1918 the Austro-Hungarian empire collapsed, and Austria and Hungary became independent states. Austria signed her peace treaty with the victorious Allies on 10th September 1919; Hungary signed hers on 4th June 1921. Both treaties were harsh. Out of a former population of 22 million, **Austria** lost 7½ million Slavs to Poland, together with 1 million other non-Germans. She also lost about 4 million Germans, 3½ million of whom went to Czechoslovakia. The might of old Austria was shattered, and she became an impoverished fourth-rate power, with a population of little over 8 million.

But Austria lost not only to Czechoslovakia and Poland. She also lost to **Italy.** The Italian frontier was advanced right up to the Brenner Pass, giving her 1¼ million Germans. In addition, Italy, by extremely doubtful diplomacy with Yugoslavia, gained Fiume, several Adriatic islands, and about half a million Yugoslavs.

Yugoslavia herself had only just come into being. She was an enlarged version of the old kingdom of Serbia. To the old kingdom were added Montenegro, Dalmatia, Bosnia, and Slovenia; and the population swelled from 4 to 13 million. These gains were partly at the expense of Austria, but mainly of Hungary. Though she was racially more uniform than Czechoslovakia (the overwhelming majority of her population were Serbs or Croats), she proved far less prosperous in the years to come. Riots and disorders forced King Alexander to abolish the constitution in 1921, and govern as a dictator.

Like Yugoslavia, **Romania** made great gains at the expense of Hungary. Romanian diplomacy was by the sword. In August 1919 she defied the powers and sent an army into Budapest, which looted and sacked the city. Her gains included the whole of the rich area of Transylvania, and she also gained Bessarabia from Russia and the Bukovina from Austria.

After these nations had taken their shares, **Hungary** was left with a population of about 7½ million, 6 million of whom were Magyars. Czechoslovakia, Romania, and Yugoslavia between them took not only members of their own races but 3 million Magyars as well.

FOUR BALTIC STATES

In the north, the defeat of Russia by the Germans allowed four new Baltic states to emerge – Finland, Estonia, Latvia, and Lithuania. Their independence was not easily gained, and they had to struggle against the Russians, Germans, or Poles. Peace was made between **Finland** and the Russian Bolsheviks in 1920. **Latvia** and **Estonia,** which were battlegrounds in the Russo-German conflict, had to fight against both of these countries between 1919 and 1920. Eventually, however, they were admitted to the League as independent nations in 1921. The independence of **Lithuania,** challenged by Russia, Poland, and Germany, was recognised in 1922. But Poland seized Vilna, Lithuania's capital; this *fait accompli* was acknowledged in 1923.

CONFLICT IN RUSSIA

The First World War and the years immediately following were hard ones for **Russia.** After the Bolsheviks grabbed power in 1917 there were many groups hostile to them. Many of their own people, including rebel armies of 'White Russians', opposed them. The White Russians were given considerable support by Britain and France. The Russians were also faced by active intervention from enemy powers. In 1919 the Poles, anxious to enlarge their territories to the east, invaded Russia. The Russians drove them back, only to be defeated near Warsaw. The result was that in 1920 the Russians accepted a boundary with Poland which ran through Disna, Minsk, and Ostrog. This gained for Poland a population and territory about double that recommended by the Allies who had met at Versailles.

A NEW EUROPE

It is clear, then, that the First World War was decisive in the transformation of Europe. Some of the decisions were carefully thought out and wise. Others were the result of opportunism, and isolated quarrels, and pieces of diplomacy which continued for some years after the end of the war. Many of the new states proved far too weak not to fall under the influence of one of the great powers. Initially it was France, who signed alliances with Poland and Yugoslavia, and appeared to dominate the continent. But when other powers, like Germany and Russia, recovered their strength, it was only a matter of time before the boundary settlements around certain countries were openly challenged.

THE ROCK GARDEN

HAVE you ever made a rock garden? If so, you were trying to imitate the surroundings from which its flowers originally came. For most of the flowers found in rock gardens are *alpines* (see page 2625), and grow wild on mountains and stony hills. And the rock garden imitates the rocky and bare soil that is found on high and steep slopes.

Alpine flowers can, of course, be grown in pots and flower beds, but they look much better – and grow better too – when they are in a rock garden.

How to make a rock garden

The first problem in making a rock garden is to get the rocks, which should be just small enough to be handled and lifted without too much effort. If you have stone or slate quarries nearby, rocks are easy to come by, but if not, large quantities may be rather expensive.

Remember, however, that the plants you will grow in your rock garden will all be small, and some will be tiny. There is no need to make a very large rock garden; you can grow quite a number of alpines in 20 or 30 square feet.

The most important requirement of alpine plants is well-drained soil; they will not live in a place where the earth becomes wet and soggy in rainy weather, for the mountain slopes they come from are steep and well drained. This means that a steep bank is an excellent place for a rock garden. First remove all the grass and weeds, and then sink the rocks flat side down (not standing up on end), a little way into the soil. Fill in between the rocks with good soil, mixed with leaf-mould or compost, and take care to leave no hollows or cavities anywhere. The soil should not be too sandy, or it will wash away; heavy clay must also be avoided, as most rock plants will not grow in it at all.

If you have no bank in your garden it is best to make a mound of brick-rubble or clinker, cover it with soil, and then arrange the rocks on it. The rubble is necessary to ensure good drainage. Put down the coarsest rubble first and the finest on top, and follow this with a layer of rotted turf or leaf-mould. This soil layer should be 6 or 8 inches thick. A mound like this gives the advantage of a south and north slope, so that plants that like strong sun and plants that like shady conditions can both be grown. Generally, alpines like an open sky; never site your rock garden under the shade of trees.

If you have an expert gardener among your friends, ask his or her advice on the best way to make your rock garden. You will learn far more in this way than we have space to tell you here.

TYPICAL ROCK-GARDEN FLOWERS
Phyteuma comosum. Grows naturally on limestone cliffs in Italy; likes a chalky soil and plenty of sun.
Melandrium elizabethae. Another limestone flower, which blooms in July and August. It is named after an Austrian archduchess.
Campanula raineri. An alpine bell-flower.
Saxifraga vandelli. Put this saxifrage in peaty soil, without lime.
Primula glaucescens. A relative of the primrose, from Lombardy.
Aquilegia einseliana. A small columbine, from the foot-hills of the Alps.

Campanula morettiana. A bell-flower from the limestone of the Dolomite Mountains.

Sempervivium arachnoidum. Each tiny plant occupies a square inch of soil; the leaves are covered with white threads.

Anemone alpina. One of the best alpines, easy to grow.

Sedum atratum. A kind of stone-crop; most of these plants grow on rocks.

Androsace alpina. Not a very easy plant to grow.

Chrysanthemum alpinum. A golden-eyed white daisy from the Alps.

Dianthus neglectus. A very beautiful mountain pink.

Campanula spicata. An alpine plant that needs plenty of warmth and sun.

Campanula cenisia. Grows best in sand and grit with very little soil.

Senecio uniflorus. The single yellow daisy-like flower is characteristic of this plant.

Gregoria vitaliana. A mountain plant from south-eastern Europe.

Gentiana bavarica. Unlike most alpines, this gentian requires very moist conditions.

Hieraceum alpinum. A kind of hawkweed, widespread on the mountains of Europe.

Saxifraga oppositifolia. Requires a moist, sandy, peaty soil.

THOMAS CROMWELL

THOMAS CROMWELL was responsible for the transition from mediaeval England to modern England. At least, this is the view of some scholars, who credit him with planning the Reformation, creating the Civil Service, and establishing the supremacy of Statute Law as opposed to Royal Proclamation.

All this would make Cromwell one of the most important men in history. Certainly his career was astonishing. Almost nothing is known for certain of his early life, except that he was born in Putney in about 1485. By 1520 he was in the service of Cardinal Wolsey (see page 702), whose 'right-hand man' he became. In 1525 he was employed, significantly, to dissolve several lesser monasteries.

After Wolsey's disgrace in 1529 Cromwell entered the Parliament which met in November. He plunged enthusiastically into the great crisis of the time – the question of the King's divorce and England's relations with the Papacy. Cromwell's anti-clerical speeches attracted Henry's attention; in 1530 he joined the sworn council, and a year later became a member of the 'inner council' of confidential advisers.

Cromwell's Reformation

Cromwell's real influence on the course of the Reformation, and of history, dates from 1532 when he first obtained office – that of Master of the Jewels. It was then that he appears to have placed before Henry a complete plan to separate the English and Roman Churches and establish the Royal Supremacy. This seemed, indeed, the only way in which Henry could succeed in defying the Pope, marrying Anne Boleyn, and retaining the allegiance of his subjects.

Cromwell instigated the opening attacks on the Papacy (1532), and engineered the great Statutes of the Reformation: *Annates* (1533), which deprived the Pope of English revenues; *Restraint of Appeals* (1533); and the *Act of Supremacy* itself (1534). Under the impetus of his own policy, Cromwell was swept to the very centre of the government. In 1534 he became Principal Secretary and Master of the Rolls, and, in 1536, Lord Privy Seal and 'vice gerunt' (or deputy supreme head of the Church). The same year he commenced the dissolution of the monasteries in his capacity as Henry's Vicar General, an appointment made in 1535. The dissolution continued ruthlessly until 1540.

A few brief years had taken Cromwell to the pinnacle of success. A few more would see him topple and fall with equal suddenness. How did this happen? We must remember that at first the Reformation was political, not doctrinal. It rejected the Pope but retained Catholic ceremonial and dogma. Gradually Protestant influences were felt from the Continent, and Cromwell's name became associated with them. As vice gerunt, his Injunctions of 1536 and 1538 began the move towards 'Protestantism' by attacking 'excesses' in image worship and pilgrimages. Cromwell's 'Protestantism' (his private religious beliefs are still much disputed) was part of a very definite foreign policy. In the face of a possible war with Catholic France and Spain he wanted to ensure the friendship of the Lutheran princes of Germany.

But Henry had little wish to associate himself with Protestantism. He began to listen to Cromwell's enemies, and the 'Catholic' *Six Articles* of 1539 were a set-back for Cromwell's policy. But he reasserted himself, and in 1540 persuaded the King to marry Anne of Cleves, thus cementing the Protestant alliance. Henry loathed Anne from the beginning, and it was obvious that Cromwell's days were numbered. Yet, as late as

Thomas Cromwell – he helped to shape modern England

April 1540, Cromwell was created Earl of Essex and Lord Chamberlain. But the King had tired of Cromwell, just as he had once tired of Wolsey. On 10th June Cromwell was arrested. He was condemned as a heretic and traitor, without a hearing, by act of attainder. He was executed on 28th July 1540.

Cromwell's fame rests on his part in implementing the Reformation. Whether he intended it or not, Cromwell's Reformation established a very important principle of the English constitution, for all the important acts of the Reformation were *Parliamentary Statutes*. This meant that in future Parliament would consider itself entitled to endorse all great acts of State, as the Stuarts were to find out to their cost.

Administrative reform

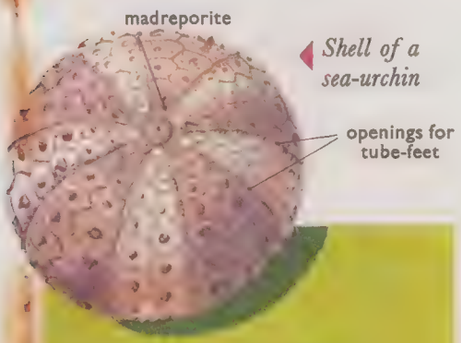
Another pillar of Cromwell's fame is his modification of the mediaeval 'household system' of administration. He set up individual courts (or departments), working more or less separately from the King and his household, as an independent 'Civil Service'. These included the Court of Augmentations and the Court of Wards, which dealt with monastic and feudal revenues respectively. Cromwell moulded the 'inner council' into an efficient Privy Council, and also elevated the position of Secretary and relegated the importance of the Great Seal.

Wolsey was the last man to dominate the government as Chancellor (keeper of the Great Seal). Cromwell began a tradition of the future which enabled 'Mr Secretary' William Cecil, together with the Privy Council, to play such a notable part in the reign of Queen Elizabeth.

Whether one accepts all that is claimed for Cromwell depends on how far one believes that Henry VIII needed someone to do his thinking for him. Was Cromwell merely his executive agent (or was Wolsey as well, for that matter?), or did he initiate his own policy? Whatever the answer, English history would doubtless have been very different if Thomas Cromwell had never lived.

SEA-URCHINS AND STARFISHES

A SWIM in the tropics can end unpleasantly if you tread on the spines of a sea-urchin. On the other hand you can tread with impunity on a starfish, which, like the sea-urchin, belongs to the Phylum of animals called Echinodermata. All of these live in the sea; the sea-urchins and starfish are the most common.



Shell of a sea-urchin

RADIAL SYMMETRY

Most animals, including ourselves, are made on a plan of *bilateral* symmetry – they can be divided into two more or less identical halves, a right and a left. The echinoderms are usually *radially* symmetrical – their parts are arranged around a central axis like the spokes of a wheel or the petals of many flowers. The normal number of radii or 'spokes' is five; this is clearly seen in the sea-urchin shown above, and in most of the starfishes on the next two pages. This five-symmetry is shared by no other animals.

Other characteristics

Sea-urchins and starfishes have skeletons made up of plates of calcium carbonate or 'chalk' embedded in their skin. Each plate is a complete crystal of the mineral; echinoderms are the only animals having 'bones' formed of crystals. Their circulatory system is also strange, for their veins contain not blood but sea-water. This 'water vascular system' consists of a main canal, forming a ring round the oesophagus, which is connected by a tube to a perforated plate or *madreporite* on top of the animal. Water is drawn in through it from the exterior. Also branching out from the ring are five canals, from which many little tubes lead off to the exterior. These tubes end as suckers, and they are called 'tube-feet', because the animal moves by them. It forces water through little sacs called *ampullae* into the tube-feet, causing them to stretch; applies the suckers to the surface on which it is lying; and contracts the tube-feet by withdrawing the water. Hundreds of tube-feet acting in co-ordination cause it to glide along.

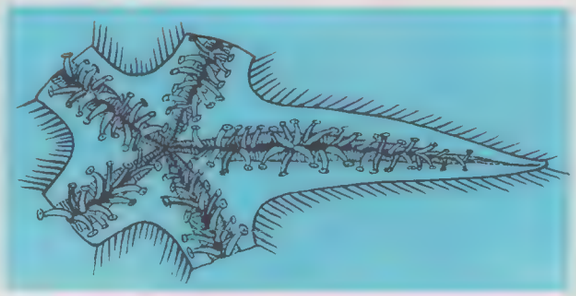
All sea-urchins and many starfishes also have numerous little two- or three-fingered pincers on their bodies, called *pedicellariae*. They are used for removing mud or sand from their bodies, capturing prey, and for self-defence. The pedicellariae of some tropical sea-urchins have poison glands and are formidable weapons.

Sucker at the tip of a tube-foot (magnified)

Tip of a three-fingered pedicellaria (magnified)

DID YOU KNOW?

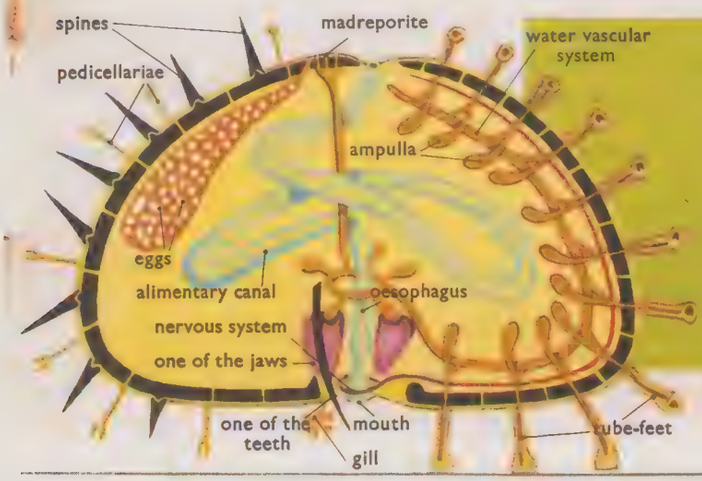
1. *Sea-water, not blood, circulates in the veins of sea-urchins and starfishes.*
2. *Sea-urchins and starfishes are the only animals made like a wheel with five spokes.*
3. *If a starfish is broken in half, both halves will grow into another starfish.*
4. *When a starfish eats a mussel it practically turns itself inside out.*



Part of the under-surface of a starfish, showing position of tube-feet

SEA-URCHINS

Sea-urchins (Class Echinoidea) are more or less globular in shape, or are flattened like a cake or biscuit. Some of the 'cake-urchins' are bilaterally symmetrical, though the five rays can still be seen. Their bodies are enclosed in a shell of hard, chalky plates, which are actually under the skin, and are covered with spines, sometimes large and thick, sometimes fine, like bristles. The plates forming the shell are in ten double bands or columns, five of which have openings for tube-feet.

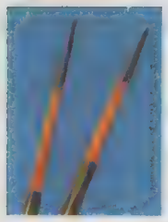


Diagrammatic section of a sea-urchin

THE MOUTH

The mouth of a sea-urchin is on its lower surface; inside it there is a peculiar structure, rather fancifully called 'Aristotle's lantern'. It consists of five complicated 'jaws', all joined together to form a cone-shaped structure; each jaw has a sharp tooth at its lower end, and the tips of the teeth can be seen through the mouth.

Mouth of a sea-urchin



The spines

In warm seas, where there are rocks or coral, sea-urchins with long, black spines are abundant. These spines are sharp, and easily pierce your skin if you brush against them; they nearly always break off, leaving the tips in your flesh. As they are barbed, they are difficult to pull out.

Some species have thick, blunt spines; if these are broken, the fracture has the form of flat planes, showing that each spine is a complete crystal of calcite, or calcium carbonate.

Two different kinds of spines – sharp (above), thick and blunt (below) – found on sea-urchins

STARFISHES

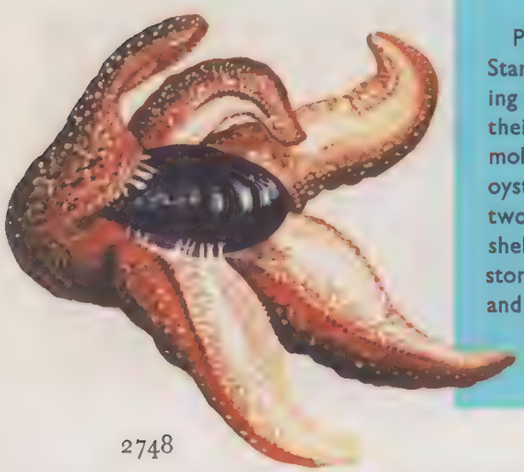
Starfishes (Class Asteroidea) are usually shaped like a conventional star with five rays, but some kinds have more. Their mouths are at the centre of their lower surface and their madreporites on their upper surface, as in sea-urchins. Their tube-feet lie in open grooves, running along the lower surface of each ray. Their skeletons consist of plates or rods under their skin, but, unlike those of sea-urchins, they are flexible and not rigid.

① *Luidia ciliaris*, a starfish with pointed, flattened arms
② *Patiria miniata*, a species with rounded arms

Every piece a new starfish

Starfishes prey on molluscs of various kinds, and are a pest in oyster beds; when fishermen catch them they sometimes tear them in half, and throw the pieces back, hoping to kill them. But this is quite the wrong way to destroy starfishes, for each half will probably grow into a new animal. In some species, each arm or ray, if broken off, will 'regenerate' and grow into a new starfish.

Asterias devouring a mussel



PREDATORY ANIMALS

Starfishes are predators, killing other animals for food, and their favourite victims are molluscs like mussels and oysters. The starfish drags the two halves of the mollusc's shell apart, and then puts its stomach out through its mouth and digests its victim's body.

Three kinds of sea-urchins are shown above, and on the right-hand page are five species of starfishes.

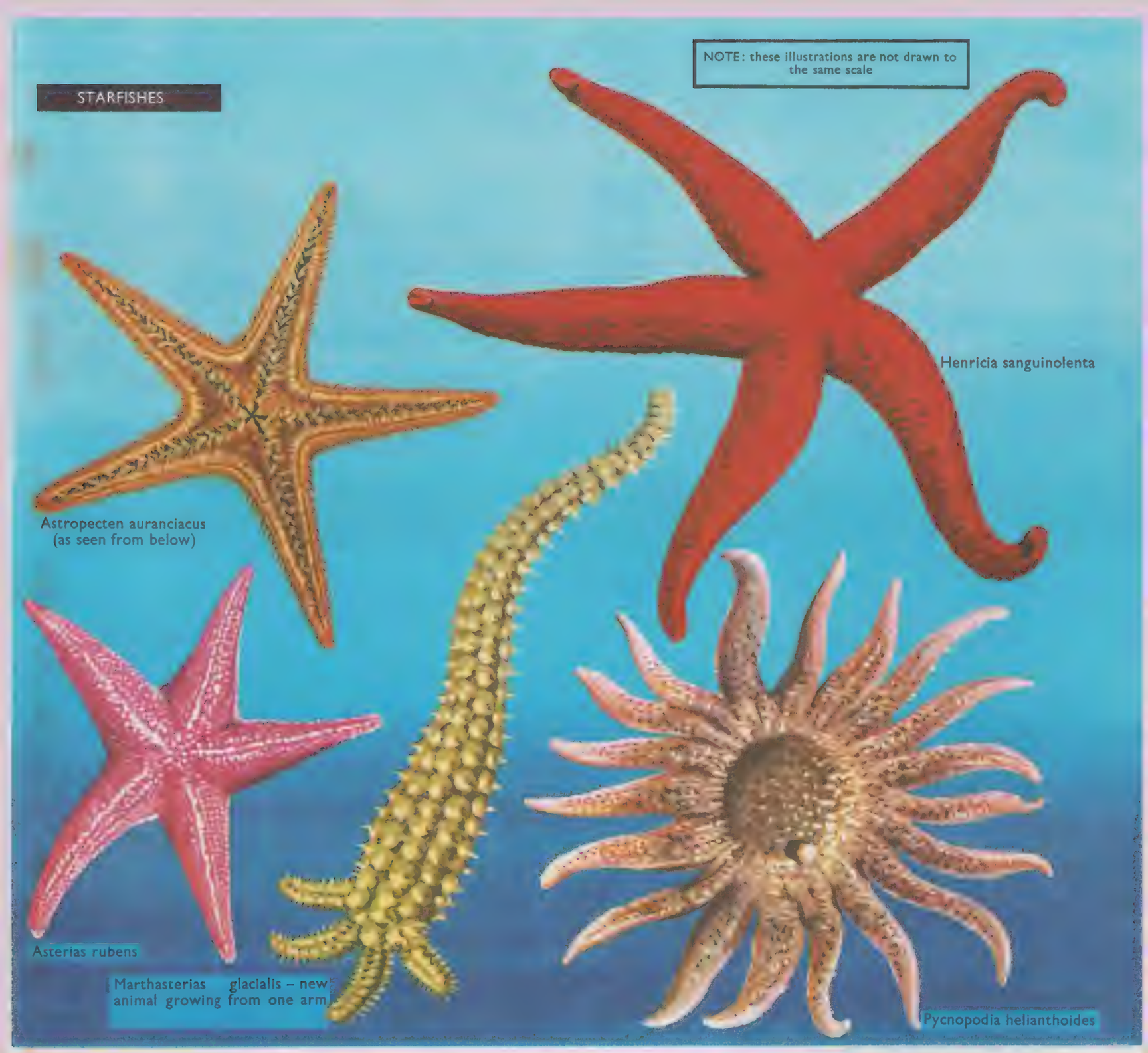
Echinocardium cordatum. A bilaterally symmetrical species, sometimes called the heart-urchin on account of its shape. It has fine spines like bristles, and is common on sandy shores, where it burrows to a depth of about 3 inches. Empty shells are often washed up; they are white and have usually lost their spines.

Echinus esculentus, common sea-urchin. This species is quite common on British shores; in the Mediterranean countries it is collected and used for food.

Heterocentrotus mamillatus, slate-pencil urchin. A species with very thick spines that lives in the Pacific and Indian Oceans.

Astropecten aurantiacus. A Mediterranean starfish with comb-like

NOTE: these illustrations are not drawn to the same scale



teeth or spines along the edges of its arms. Here it is shown upside-down, and its tube-feet can be seen in the grooves that run along each arm.

Asterias rubens, common starfish. Most of the starfishes washed up on the shore belong to this species. They vary from orange to violet in colour.

Henricia sanguinolenta. A very handsome species with a beautiful, rich red colour. It is fairly common on both sides of the Atlantic, and lives in deep as well as shallow water.

Marthasterias glacialis, sp ny starfish. A pale greenish or yellowish species, usually 8 inches to 1 foot across; its body is soft and covered with knobs and spines. It often throws off its arms when handled, and each arm may grow four new arms at its base, and so become a new starfish. The one shown has just started this process.

Pycnopodia helianthoides. A very large starfish of the American Pacific coast, with 19 to 24 arms; it may grow to 2 feet across.

THE 'COMET STARFISH'

Besides *Marthasterias glacialis* (shown above), a number of other species have the power of regenerating a whole animal from one severed arm. In the early stages of this process the animal looks rather like a comet.

HANSEATIC LEAGUE

TODAY Lübeck is not one of the great cities of Europe, or even of Germany. But in the Middle Ages it was at the very centre of Europe's commercial life, as an important Baltic port and a free city within the Holy Roman Empire. In its closely packed houses lived men whose thoughts went far beyond the walls of their city: to the Steelyard in London; to the German Wharf in Bergen, Norway; even as far afield as St Peter's Court in Novgorod, Russia. They were concerned with the political activities of the great German princes; the rate of exchange in Flanders; the state of the fur trade in Russia and the wool trade in England. These men were the merchants at the heart of one of the most remarkable trading associations in European history – the Hanseatic League.

A merchant of the Hanseatic League working in his office

The trend to unity

In the 12th century trade began to expand in Europe, and soon German merchants were trading extensively around the Baltic. Ports like Lübeck grew larger; German trading villages were founded in Riga (1201), Reval (1219), Narva (1223), and Dorpat (1225). German merchants appeared in the great Russian city of Novgorod, and brought back wax, pitch, tar, hemp, flax, charcoal, and furs to western Europe.

At this time the power of the Holy Roman Empire was weak, and the territorial princes were often hostile towards these enterprising townsmen. The traders therefore banded themselves into groups to give themselves greater protection at home and also greater bargaining power abroad.

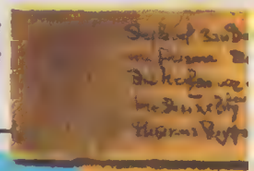
The first association of German traders abroad was the *Gothland Union* which dominated trade with Novgorod. But in the course of the 13th century this union gradually declined, and a new association began to form around Lübeck, a leading 'Gothland' town. Lübeck was the first trading city on the Baltic to extend its activities to the west, and in the first half of the 13th century north German merchants moved into the prosperous markets of Flanders and England. There they sold grain, beer, cod, herring, and furs. In 1241 Lübeck and Hamburg, another flourishing port, took a momentous step: they agreed to pool their resources to safeguard the trading routes in the Baltic and North Seas, and to protect their merchants from pirates. In 1259 came a union of the 'Wendish' towns: Lübeck, Wismar, Rostock, and Straslund.

The Hanseatic League develops

The German Baltic traders made rapid progress. In 1266 and 1267 Lübeck and Hamburg were given rights by Henry III which enabled them to establish 'companies' or *Hanse* in London. (The word 'hansa' came into the English language to denote any group of German merchants, but was later used in describing the trading association of German towns which grew from these groups of merchants – the Hanseatic League.)

Lübeck's new status inevitably brought conflict with Cologne, which had had its own *Hanse* in London for over a century. Eventually an

The key of the counting house in Bruges



Lübeck in the Middle Ages (from a contemporary drawing). Once a tiny fishing village, Lübeck grew to be a great city and a centre of European trade

agreement was reached in 1282 by which the towns combined to form one 'German Hansa'. Similar progress was made in Flanders (where in 1309 the Germans were exempted from the duties which Bruges imposed on all other merchants) and in Norway (where in 1343 the Germans were granted special privileges in Bergen). So, by the mid-14th century, the loose association of German (or Hanseatic) merchants controlled not only the Baltic trade with Russia but also the cloth trade in Flanders and the Scandinavian trade in copper, iron, timber, and fish.

It is impossible to give an exact date for the formation of the 'real' Hanseatic League or League of Towns, but it was certainly in existence by the 14th century. The troubled politics of this period made the merchants seek the protection and backing of their home towns, for they had no government to go to war on their behalf. And the towns, for their part, began to identify their cause with that of the merchants. It was a logical step for an increasing number of towns to band together to gain privileges and provide joint protection for their merchants. For example, when in 1358 Bruges took away the privileges of the Hanseatic merchants, the German League towns, headed by Lübeck, retaliated by prohibiting all trade with Flanders. As a result, the merchants' privileges were restored in 1360. In the negotiations, the term 'German *Hanse*' was used to describe all the League towns.

In 1418 Lübeck was acknowledged as the leader of the Hanseatic towns. The League had its own *general assembly*, but this met at irregular intervals and had no absolute authority. Its representatives had to return to their respective towns where the assembly's decisions were accepted or rejected. Nevertheless, the assembly was strong enough to bring unruly members like Cologne and Bremen to heel when necessary.

The economic power of the League depended on establishing monopolies (sole trading rights) in the major trading centres. In these centres they had counting houses, or *Kontors*, staffed by aldermen and other Hanseatic officials. The most important were the Steelyard in London, St Peter's Court in Novgorod, the German Wharf in Bergen, and the one in Bruges.

It is impossible to say how many towns belonged to the League, for no official list was ever drawn up, and there were many claims to membership. Some authorities put the number as high as 166, others at around 70. The principal members, after Lübeck, were: Reval and Riga on the Baltic, Danzig and Thorn in Prussia, and Magdeburg and Cologne.

The main trading areas of the Hanseatic League in the 15th century

Decline

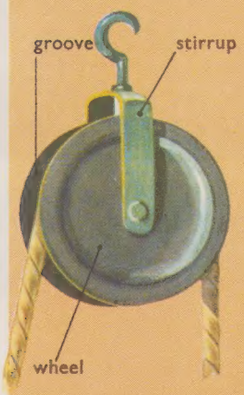
In the 15th century signs of strain appeared. Increasing competition from abroad led to a weakening in the League's solidarity. The League fought fiercely to retain its position in frequent skirmishes with the Scandinavian countries, a war with Holland (1438–1444), and a war with England (1468–1474) from which Cologne held aloof. The *Hanse* suffered in Russia when Novgorod was annexed to the state of Muscovy, and St Peter's Court was closed in 1494.

But the real decline came in the 16th century. The reason was simple: the emphasis of trade had shifted, and the old mediaeval trade routes were giving way to new ones. In England the Merchant Adventurers superseded the *Hanse* and even captured their Baltic trade. The expanding cloth industry used English ships to export its goods. The *Hanse* in England had ceased to be of importance by the end of the 16th century, and the *Kontor* at the Steelyard was closed in 1598. The Dutch gained control of the herring industry and competed with the *Hanse* in the North Sea. Their port of Amsterdam increased in importance as the Flemish trading centres declined.

The Thirty Years War ruined Germany and destroyed the remnants of the once mighty League. Its last meeting took place in 1669, when only nine towns were represented.

PULLEYS (part one)

WE have all stood, at some time, watching builders at work on a house. When they reach the second storey they must find some means of raising large weights that are too heavy for men to carry up with ease. The simplest way to solve the problem is to use a pulley, or set of pulleys; for the pulley is a simple device which enables weights to be lifted with far less effort than would be required to lift them by hand.



Parts of a pulley

THE SECRET OF THE PULLEY

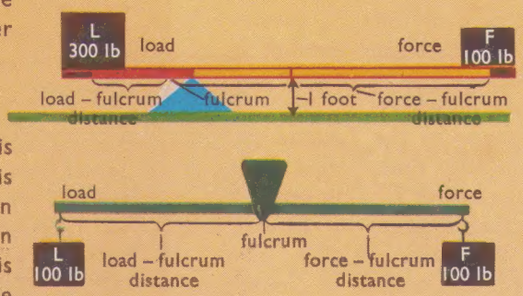
A pulley system consists of a rope which passes over and under a set of grooved wheels. A pulley does not itself provide energy to help with the task, as, for instance, an electric motor does, and the total amount of work a man must do is not reduced by the pulley.

Most men are capable of carrying a 20-pound weight up a mountain 1,000 feet high, but no man can lift a 20,000-pound weight (nearly 9 tons) unaided through a height of 1 foot. However, in both these instances the total amount of work done is the same – 20,000 foot pounds (see page 508). A system of pulleys enables a man to lift 20,000 pounds through 1 foot, but to do so he must work as if he were lifting 20 pounds by 1,000 feet. This is the secret of the pulley.

A pulley works like a lever. We know that by using levers we can lift heavy loads by applying far smaller forces at other points on the lever. The lever is said to give an increase in 'mechanical advantage'.

In the upper diagram (below) we have a 100-pound weight balancing a load of 300 pounds, since the pivot, or *fulcrum*, is not in the centre of the lever. A little extra push will move the 100-pound weight to the ground. It will move through 1 foot. The 300-pound load will not move by 1 foot, but only about 4 inches. So to move 300 pounds by 4 inches the 100-pound weight must move down by 1 foot. The amount of work which is done on both sides of the lever is the same, equal to 100 foot pounds ($100 \times 1 = 300 \times \frac{1}{3}$).

In the lower diagram the pivot is in the centre; the load at one end must equal the force exerted at the other to keep the lever level.

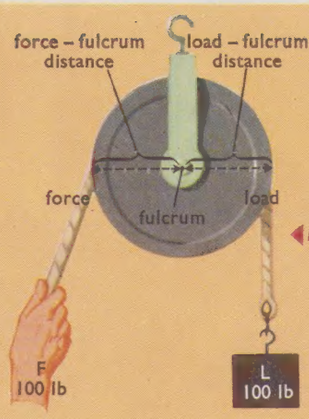


The position of a lever's fulcrum determines the force and load needed to balance it

The fixed pulley

The fixed pulley is the simplest type. It is based on a lever in which the pivot is in the centre, the load is at one end, and the pulling or pushing force at the other (as illustrated in the lower diagram on the right).

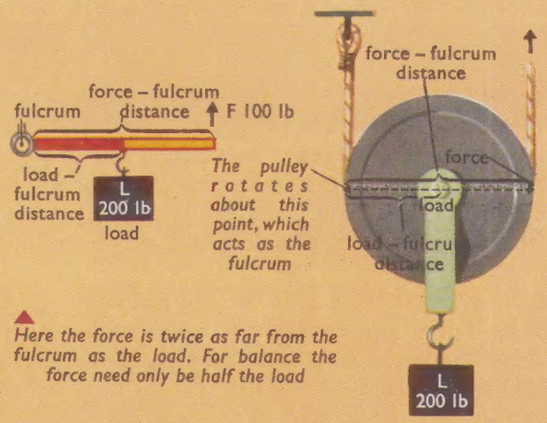
Since, in this type of pulley, the load and pulling force are at equal distances from the fulcrum, the mechanical advantage is 1; or, in other words, we neither gain nor lose anything. To lift a 100-pound weight it is still necessary for us to pull with a force of 100 pounds. However, the pulley still helps us to do this, as it changes the direction in which the force must be applied. It is easier for us to pull the rope down after it has passed over the pulley than it would be to pull it up, since, when pulling down, the whole weight of our bodies can be used.



Fixed pulley: for balance, the pulling force must be equal to the load

The free pulley

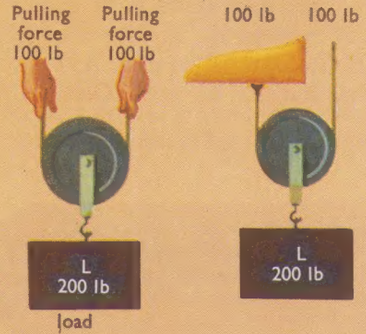
This is a better arrangement because it has a mechanical advantage of 2; that is, we need pull with a force equal to only half the weight of the load we want to raise. The free pulley is similar to the second type of lever, in which the fulcrum is at one end, the load in the middle, and the force at the other end.



Here the force is twice as far from the fulcrum as the load. For balance the force need only be half the load

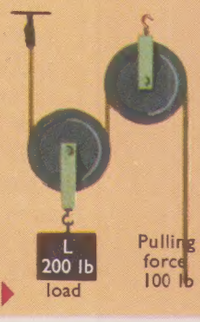
The free pulley acts as a lever with the force twice as far from the fulcrum as the load. For balance the force on the rope need only be half the force due to the load

To show this more clearly, let us imagine we are holding the two ends of the rope with one in each hand. It is obvious that each hand will support half the load. If we replace one hand by a solid support for the end of the rope, then clearly the support shares half the load, so we need only pull on the other end with half the force that the load is exerting on the pulley.



Using a free pulley halves the pulling force needed to lift the weight

Since it is easier to pull a rope down than to pull it up, a fixed pulley is also used in order to reverse the direction of the pull. This, of course, does not affect the mechanical advantage of the system.



A free pulley with a fixed pulley

The reason for two pulleys: it is easier to pull downwards on the rope in order to pull up the weight

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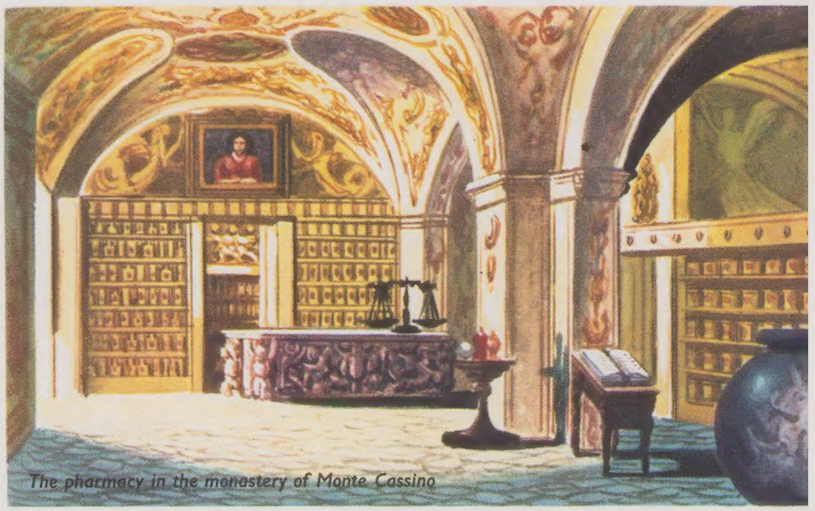
men of other races who came to study their skills and then spread them throughout Europe.



The pharmacy in the monastery of Monte Cassino

Pharmacy in Britain

After the conversion of England to Christianity, at the end of the 6th century, the skills of pharmacy became largely the business of the monks. These men were learned, and, being charged with the welfare of their fellows, they studied Greek and Arabian writings. Each monastery had its herb garden and its apparatus for storing herbs and preparing medicines. As the climate of Britain was too cold for the cultivation of some of the spices and drugs needed, men imported and traded in these commodities. Among the first to do so were the members of the Gild of Pepperers, who operated in the 12th century. Later the Spicers, Grocers, and Apothecaries engaged in the same trade.

A mediaeval pharmacy, carved in stone

As the years went by the business of trading in drugs and making up medicines became concentrated in the hands of apothecaries, many of whom practised as doctors, and a new group of merchants called *drugsters*. The drugsters were the forerunners of the wholesale pharmaceutical chemists and the high street chemists and druggists of today.

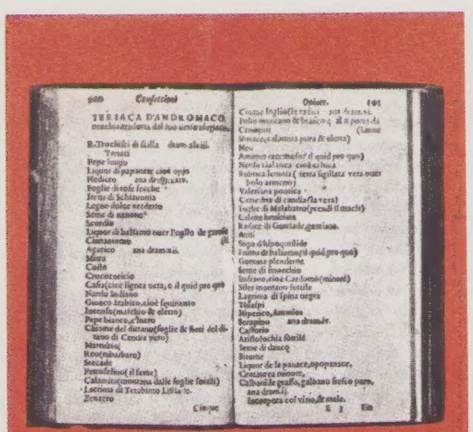
A 15th-century pharmacy

Pharmacy in the 20th century

The 20th century has seen changes in pharmacy far greater than in all its previous history. In part, these have been due to the practice of scientific medicine, and in part they have been the result of the growth of large pharmaceutical manufacturers equipped with all the machinery for mass production.

Scientific medicine has brought understanding of the causes of many diseases and of the drugs needed to prevent and cure them. The manufacturers have responded wonderfully to this challenge, and today more effective drugs are available than ever before. In fact, many diseases regarded as incurable at the beginning of the century can now be either cured or brought under control.

Mass production has had an almost equally important effect. The pharmacist no longer prepares every medicine from the contents of the bottles on his shelves. Most medicines are now prepared by the large pharmaceutical manufacturers, who supply them 'ready-made' to the pharmacist. In many cases, the pharmacist simply measures out the amount of a 'ready-made' medicine prescribed by the doctors, and attaches a label with the patient's name and address and instructions for taking the medicine.



Two pages from a mediaeval pharmacopoeia, showing the recipe for theriac, the antidote effective in all cases of poisoning

A container used for the storage of theriac

Four landmarks in British pharmacy

The Leech Book of Bald. This famous book appeared in the 10th century. Hand-written in Anglo-Saxon,

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it is the first book of medical treatment (*therapeutics*) to originate in Britain. Much of its contents comes from older Greek and Arabic texts. It has recipes for medicines prepared from herbs, and instructions for preparing drugs from animals' tissues. Some remedies are said to work better if taken in ale or wine.

Charter granted to the apothecaries. In 1617 James I granted a charter to apothecaries working within 7 miles of the City of London. They were thus permitted to work independently of the Grocers, with whom they had previously been associated. The Charter was important, for it not only enabled the apothecaries to form a separate society but also provided considerable protection for their businesses. Only members of the society (there were 122 at first) were permitted to practise within the 7-mile limit, and there were rules for the examination of apothecaries' premises and stock, and also for testing their skill in dispensing.

Pharmacopoeia Londinensis, 1618. In the year following the grant of the Royal Charter to the apothecaries the *Pharmacopoeia Londinensis* was published. It was prepared by members of the Royal College of Physicians, and, in the words of its dedication, apothecaries were to depart from its formulae 'not even a finger's breadth'. The *Pharmacopoeia* applied not only to London but to apothecaries throughout the country. It was, in fact, the first national pharmacopoeia ever to be published. The first edition appeared in May 1618, but was withdrawn soon afterwards. It was followed in December by a much larger version containing many more formulae.

Formation of the Pharmaceutical Society of Great Britain. The Apothecary's Act of 1815 enabled suitably trained apothecaries to practise both as doctors and pharmacists. The apothecaries guarded the former privilege jealously, even to the extent of bringing prosecutions against chemists and druggists suspected of giving medical advice. A group of druggists met in the Strand Tavern in 1841 to protect their rights, and formed the Pharmaceutical Society of Great Britain. Two years later the society was granted a Royal Charter.

Front of Renaissance pharmacopoeia

Today the Pharmaceutical Society is the organisation charged with the examination and registration of everyone who practises as a pharmacist. It sees that the high standard of the calling is maintained, and protects its members from the activities of unregistered people.

Antidote: A drug which counteracts the effects of a poison or the action of another drug.

Chemist: Strictly speaking, this means someone qualified in some branch of chemistry. It is often used, however, to describe a pharmacist, particularly in the expression 'chemist and druggist'.

Ethical preparation: A medicine which is not advertised to the general public, but only to doctors and pharmacists.

Formulary: A book of prescriptions.

Galenical: Medicine intended for human use, prepared from herbs.

Herbal: A book describing herbs and the methods of preparing remedies from them.

Homeopathy: A system of medical treatment in which very minute quantities of drugs are prescribed.

Manufacturing chemist: This expression seldom means a single individual, but usually a commercial firm engaged in the business of manufacturing chemicals and medicines.

Pharmacopoeia: A book containing the descriptions, sources, and tests of purity and potency of drugs.

Pharmacologist: One engaged in pharmacology.

Pharmacology: The science concerned with the actions of drugs on the body.

Pharmaceutical: This adjective is frequently used as a noun to describe a medicine, particularly an ethical preparation.

Pharmaceutical chemist: This expression is used to describe a person who is engaged either in work to discover new remedies or in the bulk preparation of known ones. However, it is sometimes loosely used to mean a manufacturing chemist.

Pharmacist: A qualified person whose task is to prepare and to dispense medicines.

Pharmacy: This word can mean the art of preparing medicines. It can also mean the room or shop in which this work is done.

Pharmacognosy: The study of the origins and sources of crude substances used in the preparation of drugs.

Polypharmacy: The use of medicines containing very large numbers of ingredients. It is in general out of favour at the present time, and is often referred to as 'blunderbuss treatment'.

Prescription: The recipe for a medicine which a doctor writes for a pharmacist to dispense. It also contains the instructions for taking the medicine, which the pharmacist writes on the bottle or package.

Proprietary medicine: A medicine prepared ready-made by a pharmaceutical chemist. It is sold under a name invented by the manufacturer and is often protected by a patent.